

DESIGNING COGNITIVELY EFFICIENT ARABIC LEARNING MATERIALS: A SYSTEMATIC REVIEW BASED ON COGNITIVE LOAD THEORY

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Abstract

Excessive cognitive load is often a major obstacle to the effectiveness of Arabic language learning, especially for learners facing the complexities of the language's morphological and syntactic structures. This study aims to examine how Cognitive Load Theory (CLT) can be strategically applied in designing efficient Arabic language learning materials oriented toward improving student comprehension and retention. This study used a systematic literature review approach to various relevant studies published between 2015 and 2025, focusing on the application of CLT in instructional design and foreign language learning. The results of the review indicate that the application of the main principles of CLT intrinsic load management, German load enhancement, and extraneous load reduction contributes significantly to increasing the effectiveness of the learning process. Managing intrinsic load through arranging the material sequence according to the student's level of complexity can optimize working memory capacity. Increasing German load through elaborative activities such as contextual comprehension exercises and metacognitive reflection helps deepen schematic representations of the language. Meanwhile, reducing extraneous load through information segmentation, the use of targeted multimodal media, and presenting simple instructions has been shown to reduce irrelevant processing load. These findings confirm that the design of Arabic language learning materials needs to consider the limitations of human working memory capacity and the principle of cognitive efficiency. Consequently, Arabic language material developers and instructors are advised to adopt a CLT-based design approach to make the learning process more adaptive, effective, and sustainable.

Keywords: Arabic Language Learning, Cognitive Load Theory, Instructional Design



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INTRODUCTION

Arabic language learning in various Islamic educational institutions faces real challenges. Although Arabic is often viewed as the primary language in Islamic religious and educational contexts, its effectiveness is often low. The main reasons include the complexity of Arabic's morphological and syntactic structures, such as the root-consonant system, vocalization, and agglutination, as well as the variety of dialects and standard language, which require in-depth understanding from students. For example, a study on the adaptation of Arabic learning resources stated that the language "is a complex language, characterized by its flexion, voyellation, and agglutination." Furthermore, many Islamic educational institutions use traditional approaches that rely heavily on vocabulary memorization, classical grammar instruction, and repetitive drill activities without considering students' cognitive aspects and working memory load. As a result, many students exhibit decreased motivation, shallow understanding, and poor retention in Arabic learning.(Wan Nailah, Abdullah Syahiza, Hasnisah, and Rahayati, Ahmad Muhammad 2023)

Along with the development of research in educational psychology and cognitive science, various theories and approaches to instructional design have emerged based on an understanding of how humans process information and learn. One important theoretical framework is Cognitive Load Theory (CLT), pioneered by John Sweller in the late 1980s. CLT emphasizes that human working memory capacity is limited, and that instructional design that fails to account for this limitation can hinder effective learning. (Asma and Dallel 2020) In the realm of second language (L2) or foreign language (EFL/ESL) learning, cognitive approaches such as CLT are gaining increasing attention, for example in research applying CLT techniques to the teaching of tenses in English for L2 learners.

Comparing traditional approaches with CLT-based approaches, fundamental differences become clear. Traditional approaches to Arabic language learning often focus on memorization, repetition, and explicit teaching of grammar rules without systematic consideration of the cognitive load they impose on students. Methods such as forcing students to memorize large amounts of vocabulary, reversing root conjugations, or demanding extensive repetitive practice often result in a high workload on students' working memory and cognitive resources. As a result, students can experience cognitive fatigue, decreased attention, and suboptimal transfer to long-term memory (schemas).(Assis Hornay 2021)

In contrast, a CLT-based approach emphasizes cognitive efficiency: by identifying and managing various types of cognitive load intrinsic load, load generated by poor instructional design (extraneous load), and load relevant to schema formation (germane load), the design of learning materials can be made more adaptive, efficient, and supportive of deep understanding and long-term retention. For example, tasks can be segmented into smaller parts to reduce excessive element interactivity (intrinsic load management), the use of multimodality and clear instructions to reduce extraneous load, and reflective or elaborative activities to increase germane load. ASMA Thus, the use of CLT in the context of Arabic language learning has the potential to increase learning effectiveness by reducing unnecessary cognitive load and focusing students' cognitive energy on activities that truly support Arabic schema formation.

The CLT conceptual framework itself consists of three main components:

1. Intrinsic cognitive load: The load caused by the complexity of the material to be learned. The more interactive elements that must be processed simultaneously, the higher the intrinsic load.(Syagif 2024)
2. Extraneous cognitive load: The load that arises from suboptimal instructional design, such as confusing instructions, unintegrated multimedia, and divided attention between irrelevant elements. This load does not directly support learning and can actually hinder it.(Suek 2018)
3. Germane cognitive load: The load that describes cognitive effort that supports the formation and automation of schemas (structured knowledge). This load is a "good load" that should be maximized in instructional design.(Assis Hornay 2021)

By understanding these three components, Arabic language learning material developers and teachers can design activities and learning resources that consider students' working memory capacity, reduce irrelevant activities, and increase activities that support the formation of Arabic schemas.

Although the concept of CLT has been widely applied in the context of mathematics, science, and English as a second language, there is a clear evidence gap when we turn to the context of Arabic language learning. For example, while there are articles discussing the implications of CLT for Arabic language learning in primary education in Indonesia (John Sweller's Cognitive Load Theory and Its Implications for Arabic Language Learning in Primary Education), research systematically linking CLT to Arabic language material design, conceptually and empirically, remains limited. Furthermore, while there are studies measuring the relationship between cognitive load and the difficulty of language test items (e.g., in EFL tests), specific applications to Arabic are still very rare. This suggests that conceptual and practical guidance on how CLT can be operationalized in Arabic language learning contexts is scarce.

This gap statement is crucial: while CLT theory offers a promising framework for enhancing learning effectiveness through cognitive load management, in practice, there is still a lack of guidance specifically linking CLT components to Arabic language material design (e.g., vocabulary modules, root-word learning, Arabic grammatical forms, multimodality exercises, etc.). Without strong conceptual and empirical guidance, the development of CLT-based Arabic language learning materials tends to be intuitive and lack systematic approach.

Therefore, the purpose of this study is to conceptually analyze the influence of Cognitive Load Theory on the design and effectiveness of Arabic language learning materials. By conducting a systematic literature review of relevant literature (2015–2025) on the application of CLT in instructional design and language learning, this study aims to produce a conceptual framework that can be used as a reference for Arabic language material developers. It is hoped that this research will offer practical and conceptual direction so that Arabic language learning materials can be designed by considering intrinsic load management, extraneous load reduction, and germane load enhancement, thereby making the learning process more efficient, meaningful, and sustainable.(Nuryadin, Irfan, and Layinah 2024).

RESEARCH METHOD

This study employed a library research design with a thematic analysis approach to relevant literature. This method was chosen because the research focused on conceptual and theoretical studies related to the application of Cognitive Load Theory (CLT) in Arabic language learning material design, rather than primary field data collection.

This study adopted a library research design that collected and analyzed secondary literature (scientific articles, books, proceedings) from 2015 to 2025. Following literature collection, a thematic analysis was conducted based on the three main dimensions of CLT: intrinsic load, extraneous load, and germane load. The thematic analysis approach enabled the identification and synthesis of relevant patterns and findings for the Arabic language learning context. (Sari and Asmendri 2018)

The data sources for this study included:

1. Peer-reviewed scientific articles discussing CLT in the context of instructional design, second language (L2)/foreign language (EFL/ESL) learning, and Arabic language learning specifically. Examples: Arab World English Journal, which discusses CLT and instructional design. (Khoerunisa, Tanjung, and Fanirin 2024)
2. Books and book chapters (edited collections) that discuss CLT and its applications in language learning or multimedia instruction, for example, the chapter "Cognitive Load Theory and Instructional Design for Language Learning" in the Cambridge Handbook of Working Memory and Language. (Khalilah et al. 2025)
3. Conference proceedings and review articles that discuss CLT in the context of digital/multimedia learning or language as an L2, for example, an analysis of CLT in microlearning and in multimedia e-learning. (Mecerhed and Touat 2021)
4. Specific literature that discusses Arabic learning as an L2 or cognitive factors in the Arabic context, for example, the article "Cognitive Load Theory Arabic Language Learning in Primary Education in the Fashluna journal. (Syagif 2024)

Inclusion criteria: only literature published between 2015 and 2025, in English or Indonesian, that explicitly addresses CLT or cognitive load in the context of learning or instructional design. Exclusion criteria: literature that only discusses CLT generically without any connection to language learning or instructional design, or that only covers cognitive architecture without instructional applications.

The main instruments used were content analysis and literature synthesis through the following procedures:

1. Carefully reading the abstracts, methods, results, and discussions of each selected literature.
2. Coding the findings of each literature into predetermined categories: intrinsic load, extraneous load, German load, and implications for instructional design.
3. Identifying emerging themes relevant to Arabic language learning for example, material segmentation, multimodality, Arabic vocabulary scaffolding, reducing redundancy, managing the interactivity of Arabic language elements, and so on.
4. Conducting a narrative synthesis that maps how each literature applies or recommends CLT strategies in instructional design, and how these strategies can be adapted to the Arabic context.
5. Developing a conceptual model for implementing CLT in Arabic language material design by showing the relationships between CLT components and material design variables (e.g., vocabulary modules, root-word exercises, Arabic audio-visual multimedia, etc.). (Ubaidillah, Millah, and Sapitri 2024)

The analysis was conducted through three systematic stages:

1. Identifying relevant CLT principles for Arabic language learning.

In this stage, the literature was reviewed to identify CLT principles (e.g., worked-example effect, split-attention effect, modality effect, redundancy effect) that have been demonstrated in language learning or multimedia instruction. For example, the study "A Study on EFL Instructional Design from the Perspective of Cognitive Load Theory" demonstrates the use of split-attention and redundancy principles in English language learning.

ojs.piscomed.com Also, the study "Managing Working Memory in Language Instructions: An Overview of CLT" discusses the application of CLT in language learning in general.

2. Analyzing the suitability of Arabic language material design to these principles.

This stage involved mapping literature findings specific to Arabic and L2 learning against CLT principles. For example, an article discussing cognitive load in Arabic language learning at the elementary level demonstrated a strategy for reducing intrinsic load through material simplification. ejournal.stitbima.ac.id This analysis evaluates the extent to which Arabic language material design (modules, media, exercises) has considered the three dimensions of CLT: managing intrinsic load, reducing extraneous load, and increasing germane load.

3. Developing a conceptual model for implementing CLT in Arabic language learning design

From the results of the analysis in stages 1 and 2, a conceptual model was developed that explains how Arabic language instructional designers can systematically apply CLT: starting from analyzing the complexity of Arabic language material (intrinsic), instructional design that minimizes irrelevant or confusing elements (extraneous), and activities that support the formation of Arabic language schemas (germane). This model will be complemented by design recommendations such as material segmentation, the use of audio-visual multimodality, scaffolding Arabic vocabulary and morphological structures, and evaluating/monitoring students' cognitive load. (Ritonga, Fuadi, and Ritonga 2024)

In this type of desk research, reliability is strengthened through literature triangulation procedures, namely using various types of sources (articles, books, proceedings) and ensuring that the literature retrieved comes from relevant contexts (L2 language, Arabic language learning, instructional design). Thematic validity was strengthened by documenting the coding and synthesis process and presenting direct quotations from the literature to support interpretations. (Tampubolon 2022)

Because this study is a literature review, there is no primary data from Arabic language students or direct empirical measurements of cognitive load in an Arabic context. Literature specific to Arabic and the application of CLT is limited, so the conceptual model created is theoretical in nature and requires further empirical validation. The literature screening was limited to 2015–2025, so classic studies prior to 2015 that may be relevant were not the primary focus.

RESULTS AND DISCUSSION

A thematic analysis of the literature between 2015 and 2025 shows that the application of CLT in language learning produces a number of consistent key patterns, particularly in the context of second language (L2) learning and increasingly emerging in the Arabic language learning literature. The main findings can be organized into three dimensions of CLT cognitive load: extraneous, germane, and intrinsic.

A. Reducing Extraneous Load

Many studies highlight that poor instructional design, such as overly dense text, graphics and text that require split attention, and multimedia with redundant narratives and text, increases extraneous load that does not contribute to learning. In response, materials design that applies CLT principles takes steps to reduce extraneous load through visualization, text segmentation, grammatical scaffolding, and targeted multimedia.

1. A study on elementary Arabic language learning noted that teachers can “reduce extrinsic cognitive load by improving the quality of media, teaching materials, and relevant and interactive teaching strategies. (Syagif 2024)

2. A study in the L2 (English) context reported that the use of worked examples, split-attention avoidance, the modality effect, and the redundancy effect proved effective in reducing extraneous load. (Maryani, Syafei, and Kosim 2024)
3. In the e-learning literature, an article mentions that computer-assisted learning design that takes cognitive load into account shows that changing the presentation format (for example, integrating visuals and text separately) helps reduce extraneous load. (Sweller, van Merriënboer, and Paas 2019)

In the context of Arabic language learning, particularly in digital learning or online modules, this means that material such as vocabulary, grammar, or long Arabic texts can be broken down into smaller segments, provided with supporting visuals or audio, and instructions simplified so that students are not overburdened by elements that do not directly support learning.

Table 1. Research Findings on Reducing Extraneous Load in Language Learning

Aspect / Focus	Main Findings
Desain Instruksional Buruk Bad Instructional Design	Too dense text, split-attention (separate graphics and text), redundant multimedia increase extraneous load which does not support learning.
Extraneous Load Reduction Strategies in CLT	Visualization, text segmentation, grammatical scaffolding, directed multimedia.
Application in Basic Arabic Language Learning	Teachers can reduce extrinsic cognitive load by improving the quality of media, teaching materials, and interactive teaching strategies.
Application to L2	Worked examples, avoiding split-attention, modality effect, redundancy effect effectively reduce extraneous load.
Implementation in E-learning	Integration of presentation formats (combining visuals and text) helps reduce irrelevant content.
Implications for Digital Arabic Learning	Materials such as mufradāt, nahwū/sharaf, long texts need to be broken down into small segments, provided with visualization/audio, and instructions simplified to avoid irrelevant burden.

B. Optimizing German Load

The German load dimension relates to meaningful cognitive effort, namely activities that support the formation of schemas or knowledge structures in long-term memory. Literature findings indicate that if extraneous load is reduced and intrinsic load is managed, working memory capacity can be diverted to German activities such as metacognitive reflection, contextual rehearsal, and schema elaboration.

1. Studies on CLT in language learning emphasize that instruction utilizing worked examples, completion tasks, and scaffolding significantly supports the formation of language schemas. Thai Journal Online+1
2. In the context of L2 vocabulary learning, one study using the "cognitive load framework" (CLF) found that activities with a higher German load for example, elaborative engagement resulted in better retention. revistaseug.ugr.es
3. Specifically for Arabic language learning, basic literature research suggests that strengthening students' cognitive schemas can be achieved through "contextual practice, visualization, and consistent repetition," which increases German load. STIT Bima E-journal

The relevance of nahwū, sharaf, and mufradāt in Arabic is clear: for example, exercises that ask students to elaborate on Arabic root words in sentence context, reflect on changes in word form, or describe morphological relationships between vocabulary words can strengthen the Arabic language's structural schema.(Zhu 2022)

C. Intrinsic Load Management

Intrinsic load relates to the level of complexity of the material itself and the interactivity of the elements that must be processed simultaneously. Literature shows that if material is too complex or presented too quickly without scaffolding, the intrinsic load can be too high and hinder learning.

1. Literature studies indicate that in language instructional design, it is important to sequence material from simple to complex to avoid excessive interactivity of elements simultaneously.
2. In Arabic language learning literature, studies show that simplifying teaching materials and introducing concepts gradually are important strategies for managing intrinsic load.

Implementation in Arabic language material design, for example, includes introducing letters, vowels (harakat), then basic word forms, then derived forms or morphological changes; or a mufradāt module that begins with simple consonant roots, then progresses to plural forms, plurals, and so on.(Jumrawarsi and Suhaili 2021)

D. Relevance for Digital Arabic Language Learning

Specifically, the literature shows that CLT principles have been shown to improve comprehension and retention in grammar (nahwū/sharaf) and vocabulary (mufradāt) learning in digital or blended learning contexts. Although direct research in Arabic is still limited, several indicators support this:

1. An analytical study concluded that CLT-informed reading instruction in L2 showed increased comprehension and decreased total cognitive load. EKB Journals
2. A study at the elementary level of Arabic concluded that implementing CLT made learning “more effective and efficient, helping students gradually overcome the complexities of Arabic.” STIT Bima+1 E-journal

Therefore, designing digital Arabic language modules that take CLT into account for example, multimedia that effectively combines audio + text + visuals, module segmentation, automatic scaffolding, and contextual exercises has great potential to improve comprehension of nahwū, sharaf, and mufradāt.(Sarah et al. 2024)

E. Summary of Findings

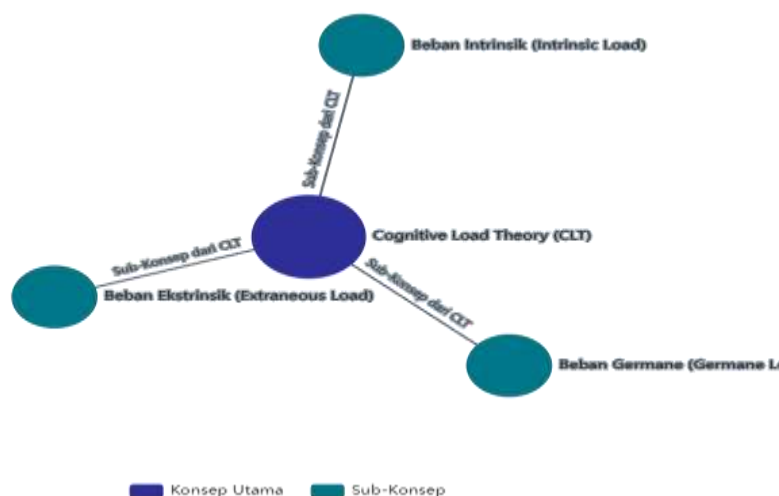
1. Reducing extraneous load through visualization, Arabic text segmentation, and grammatical scaffolding has been shown to be crucial for improving learning effectiveness.
2. Optimizing German load through contextual practice, schema elaboration, and metacognitive reflection supports better retention and deeper understanding.
3. Managing intrinsic load through a progressive sequencing of material, from simple to complex, and introducing concepts at a natural pace is crucial for Arabic as an L2.
4. Although research specific to Arabic is still relatively scarce, the broader L2 literature and several Arabic studies indicate that the application of CLT is highly relevant and promising for the design of both digital and conventional Arabic learning materials.(Hakim 2022)

F. Theoretical Interpretation

Cognitive Load Theory (CLT), pioneered by John Sweller, provides a robust theoretical framework for designing cognitively efficient Arabic language learning materials. CLT is based on the premise that human working memory has a limited capacity for processing new information, and that instructional design that fails to address cognitive load can hinder learning. As an instructional theory, CLT emphasizes three types of load: intrinsic (the load inherent in the complexity of the material), extraneous (the load created by suboptimal material design), and germane (the load allocated to deep processing and schema construction). (Sweller, van Merriënboer, and Paas 2019)

By applying the CLT framework to Arabic language learning, material developers and instructors can design modules that (a) manage the complexity of Arabic material to avoid overloading working memory (intrinsic load management), (b) minimize design elements that are unsupportive of learning or even distract students (extraneous load reduction), and (c) reinforce activities that support the formation of efficient Arabic schemas (germane load optimization). (Solikin, Asrori, and Rosyidi 2022)

In the context of learning Arabic which generally has complex characteristics such as root-consonant morphology, letter vocalization, word form changes (sharf), and grammatical structures (nahw) that differ from Latin or English the application of CLT becomes highly relevant. For example, without proper segmentation and scaffolding, Arabic grammar or vocabulary material can increase intrinsic and extraneous load, leading to cognitive fatigue or suboptimal transfer to long-term memory. Thus, CLT provides a strong rationale for designing cognitively efficient Arabic language materials. (Rochimul Umam and Nasiruddin 2024).



G. Comparison with Other Studies in the Field of Language Instructional Design

The results of the literature review indicate that the application of CLT in second language (L2) learning has proven effective in various studies. For example, in the context of teaching tenses to English learners, the study "Applying Cognitive Load Theory in Teaching Tenses for Second Language Learners" demonstrated that techniques such as worked examples, avoidance of split attention, and the modality effect successfully reduced extraneous load and enhanced learning. (Mukarrami, Qusaiyen, and Hayati 2021)

The study "A Study on EFL Instructional Design from the Perspective of Cognitive Load Theory" notes how the use of CLT principles (reducing redundancy, increasing modularization of materials) contributes to more effective instructional design. (Weng and Chiu 2023)

The study "Managing Working Memory in Language Instructions: An Overview of Cognitive Load Theory" also discusses how managing intrinsic, extraneous, and Germanic load is key to success in language learning design (grammar, vocabulary, reading, and writing). (Asma and Dallel 2020)

However, literature specifically linking CLT to learning Arabic as an L2 or foreign language is still relatively limited although studies such as "Cognitive Load Theory and Its Implications for Learning Arabic at the Elementary Education Level" demonstrate that CLT can be applied in the Arabic context.(Magbanua 2024)

Thus, the results of this study align with the general literature on CLT-based instructional design in language learning, but also emphasize that the Arabic context presents unique challenges both in terms of language structure and the use of digital/multimedia materials—that require contextual adaptation of CLT.(Nikhlatunnuha et al. 2025)

H. Strengths & Limitations of the Study

1. Strengths:

- a. This study offers a systematic conceptual analysis of the application of CLT in Arabic language materials design, utilizing the most recent literature (2015–2025) and organizing the findings into three dimensions of CLT (intrinsic, extraneous, and germane).
- b. It provides a conceptual framework that can serve as a basis for Arabic language curriculum developers, educators, and researchers seeking to operationalize CLT in Arabic contexts a contribution that is relatively rare in Arabic-specific literature.
- c. The integration of instructional design, cognitive theory, and the Arabic language learning context makes the findings relevant to 21st-century learning practices that are increasingly digital and multimodal.

2. Limitations:

- a. This study is conceptual (library research) without primary empirical data meaning there is no direct measurement of students' cognitive load or experimental testing of CLT-based Arabic language modules. This limits the generalizability of the findings to real-world settings.
- b. The specific literature on Arabic + CLT is limited, so some design implications are drawn from general L2 learning research, not specifically Arabic. Therefore, adaptation to Arabic requires further empirical validation.
- c. Because Arabic module designs vary in cultural context, level, and medium (digital vs. face-to-face), the results of this analysis need to be adapted to local conditions and may not fully capture these variations(Ghafar and Raad 2023)

I. Practical Implications

1. For lecturers and curriculum developers:

- a. Arabic language curriculum developers can use CLT as a design framework to balance students' cognitive load: from simplifying the sequence of material (managing intrinsic load), designing media and instructions that minimize cognitive distractions (reducing extraneous load), to including activities that support the elaboration and consolidation of Arabic schemas (increasing Germanic load).
- b. Arabic language lecturers can implement strategies such as module segmentation (e.g., introducing letters and vowels → root forms → derived forms/conjugations), scaffolding (providing initial support, then gradually reducing it), and directed multimedia (integrated audio and visuals) to improve learning effectiveness.
- c. In the evaluation and monitoring component, lecturers can create metacognitive reflections (e.g., "How do I remember the changes in Arabic word forms?", "What root words and derivatives have I learned?") that strengthen students' Germanic load.(Arafat et al. 2023)

2. For digital Arabic language materials:
 - a. The design of digital Arabic language modules must consider cognitive efficiency: multimedia must be well-integrated (avoiding split attention between inconsistent text and audio), modules must be segmented so that students process small sections gradually before moving on to the next, and interactive elements must be included to encourage elaboration and schema consolidation (e.g., contextual exercises with Arabic sentences, interactive quizzes, visualizations of root words and derivatives).
 - b. The use of adaptive technology (e.g., systems that adjust difficulty levels according to student progress) will significantly support cognitive load management, especially in blended or online learning. For example, the new study "Enhancing the Cognitive Load Theory and Multimedia Learning Framework with AI Insight" demonstrates the potential of integrating AI for cognitive load adaptation in e-learning. SpringerLink
 - c. Developers of digital materials must also consider the Arabic cultural and linguistic context (including dialect, written form, media type) to ensure that the design truly aligns with students' cognitive experiences.(Fitria and Putri 2022)

J. The Big Picture: CLT Integration & 21st-Century Arabic Language Learning

The integration of CLT into Arabic language material design supports the vision of 21st-century learning: adaptive learning, based on cognitive science, utilizing digital technology, and considering human factors in the learning process. By understanding how students' working memory and cognitive schemas operate, Arabic language developers and teachers can shift from traditional approaches focused on memorization and routine practice to more efficient, meaningful, and cognitively sustainable approaches.(Hastuti 2022)

The use of CLT enables higher-quality Arabic language learning: students do not simply memorize vocabulary or grammatical rules meaninglessly, but they build in-depth cognitive schemas, are able to process word changes (sharf), understand nahw structures, and apply them in real-life contexts and long-term memory.(Abna and Nawawi 2018)

In the increasingly advanced digital era, where learning materials are easily accessible through online platforms, the application of CLT becomes even more important—as multimedia, interactivity, and flexible access pose significant challenges to students' cognitive load. The study "Cognitive Load Theory: Implications for Instructional Design in Digital Classrooms" shows that digital design that fails to consider cognitive load can lead to overload and hinder learning. Thus, CLT is not only relevant for the design of traditional Arabic language materials but is also crucial for digital/blended Arabic language learning, which is well-suited to the needs of today's generation.(Astuti et al., n.d.)

CONCLUSION

This study concludes that Cognitive Load Theory (CLT) has a significant influence on the effectiveness of Arabic language learning material design, particularly through appropriate cognitive load management. Based on a literature review of various recent literature (2015–2025), CLT has proven to be a strong theoretical foundation for creating efficient, adaptive Arabic language learning that aligns with the principles of modern cognitive psychology.

Conceptually, CLT asserts that human working memory capacity is very limited in processing new information, so learning effectiveness depends heavily on the extent to which students' cognitive load can be managed in a balanced manner. In the context of Arabic language learning, this theory is highly relevant given the high complexity of the morphology (sharf), syntax (nahwu), and semantics (mufradat) systems, which often result in excessive cognitive load for learners.

The study results indicate that the application of CLT principles can be achieved through three main strategies; (1) intrinsic load management is carried out by arranging material sequentially from simple to complex concepts and providing scaffolding in the early stages of learning; (2) reducing extraneous load is achieved through the targeted use of visual and multimodal media, information segmentation, and concise and consistent instructional presentation; (3) increasing German load is achieved by adding elaborative activities such as contextual exercises, metacognitive reflection, and applying vocabulary in real-world contexts.

These three strategies complement each other in creating a cognitively efficient learning design oriented toward the construction of long-term linguistic schemas. These findings also reinforce the view that the application of CLT is not only relevant for English or other second languages (L2), but also has great potential for Arabic, particularly in digital and interactive multimedia-based learning.

Practically, the application of CLT has had a tangible impact on the development of cognitive-based Arabic instructional design models. Teachers and curriculum developers can use this theory as a guideline to balance material complexity with students' cognitive capacities, and create efficient and sustainable learning environments. Furthermore, the integration of CLT in the development of digital learning media also opens up opportunities for the creation of adaptive systems based on learning analytics and artificial intelligence that can adjust to each individual's cognitive load.

Thus, it can be concluded that Cognitive Load Theory not only offers a theoretical framework, but also provides a comprehensive practical guide to designing Arabic language learning that is more effective, scientific, and relevant to the needs of 21st-century education..

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